DOCUMENT RESUME

ED 189 937 HE 012 860

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TITLE Improving the Research Capacity of the Universities in Semi-Industrialized Countries. AIR Forum 1980 Paper.
PUB DATE Apr 80
NOTE 20p.: Paper presented at the Annual Forum of the Association for Institutional Research (20th, Atlanta, GA, April 27-May 1, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Administrative Organization; Change Strategies; College Instruction; *College Role; Comparative Education; *Developing Nations; Economic Development; *Educational Change; Foreign Countries; Governance; Government School Relationship; *Higher Education; *Research Needs; Scientific Research; Technological Advancement
IDENTIFIERS *AIR Forum 1980; *Greece

ABSTRACT

The need for research capacity in developing countries and the traditional role and structure of universities in Greece are considered. A scientific and technological research capacity is viewed as a prerequisite for economic development. Until now universities have been highly specialized teaching institutions directly subordinate to the government. In the last five years efforts for change of the universities' operational structure and of their integration into the national and local social environment have been intensified. A 1978 law to improve the university system and provisions of charters proposed by study groups and interest groups are outlined. The question of committing universities to research or not has received a positive answer by all political groups. The following two categories of research are examined according to the goals pursued: to maintain the quality of the undergraduate teaching at a high level, and to be accountable for the production of new technologies satisfying the needs of the socioeconomic environment. The first goal favors highly decentralized structure, while the second goal favors organizationally strong central authorities. (SW)

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IMPROVING THE RESEARCH CAPACITY OF THE UNIVERSITIES IN SEMI-INDUSTRIALIZED COUNTRIES

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HE 012 860

THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

This paper was presented at the Twentieth Annual Forum of the Association for Institutional Research held at the Peachtree Plaza Hotel in Atlanta, Georgia, April 27 - May 1, 1980. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

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ABSTRACT

The lack of indigenous research in developing, and particularly in semi-industrialized, countries is now considered a bottleneck to economic development, a fact which puts further pressure for change on the universities of these countries. Universities have been used, until now, as highly specialized teaching institutions. This paper has tried to analyze some factors that favor or resist change. It has examined the models promoted by different interest groups inside and outside universities and made suggestions for a strategy which will contribute to the development of research and postgraduate studies in the universities.

1. NEED FOR RESEARCH CAPACITY IN DEVELOPING COUNTRIES

There has been a lot of discussion in the last two decades on the role of science and technology in economic and social development. What appeared initially to be the key solution to problems of underdevelopment, i.e. the transfer of technology from developed to developing countries, showed its limitations. Then, the last ten or fifteen years a new concept of autonomous development has been introduced in discussions which has created an increasing awareness of the impact of indigenous research on technological and, consequently, on economic development. This was one of the main issues of the United Nations Conference on Science and Technology for Development (UNCSTD) which took place in August 1979, in Vienna, Austria, and whose principal goal was the creation of an international fund to finance technological development in the third world.

Some 140 countries and a great number of international governmental and non-governmental organizations contributed to the Conference with papers describing efforts to overcome poverty, social discrimination and unilateral dependance. Nearly all papers stressed the importance of education and research for development. Thus, the United States national paper states that "R & D, now heavily concentrated in industrialized countries should be expanded in developing countries, with greater reliance on their own scientists and engineers" (US National Paper 1979).

Furthermore, the national paper of India (India, National Paper 1979), one of the best organized developing countries on the scientific sector (CNUCED 1978), sums up the views of most of these countries by stating that

> technology imports have a major impact on the establishment and growth of indigenous R & D capability. The most obvious impact is when the foreign collaboration agreement itself has restrictive clauses prohibiting interaction with local R & D institutions. But, the indirect impact on R & D personnel, projects and programmes is far more serious. Technology import, carried out during the course of an indigenous R & D endeavour, makes the personnel frustrated, the project infructuous and the whole programme pointless. It even generates a widespread feeling that the national climate is hostile to indigenous technological capability, whether in fact this is the case or not.

Complementary to this political statement, which looks at science as a whole - a coherent living system - and not as the sum of compartmentalized knowledge, are the findings of a study sponsored by the French central science policy authority (Délégation Générale à la recherche scientifique et technique) (Dufourt 1979). This study has established that the basic concept which assumed that knowledge is flowing continuously from fundamental science to applied science, to technology and then to application and diffusion of technology, has dominated the discussions on science policy in recent years. This concept has biased the view on technology transfer. It permitted the division of responsibilities among countries, the most developed being responsible for fundamental science and the developing for application and diffusion of technology. It has led the policy makers to underestimate the importance of the horizontal transfer and of several human and social factors which are necessary for the functioning of the innovation process. The study concluded that fundamental science and technology need to be active in the same environment where the international - vertical type - transfer of technology is taking place.

Therefore, the building of a local scientific and technological research capacity becomes a prerequisite for economic development. The question which first arises is that of creating or reinforcing the appropriate institutions for the purpose of increasing and improving research capacity. The second question concerns the role of universities in the general national effort. Is it desirable that universities be seriously involved in the research effort, or should research be entrusted mainly to specialized institutions (as many countries suggest)? What kind of research should be promoted in universities? Are the present structures, processes and policies appropriate for fundamental or applied research and, if not, what kind of reforms should be undertaken to achieve these goals?

In the following pages, after a brief description of the recent and present status of universities in an economically developed but scientifically developing country, we are going to discuss some aspects of these questions. We will analyze some features of the reforms proposed in order to adapt the system to actual socio-economic needs especially the capacity of the system for self-renewal and examine the limitations of the reforms related to research. In the last paragraphs we try to identify any incompatibilities between proposed goals and structures and suggest some elements of a strategy to overcome resistance. Many decisions to be adopted by national or university authorities need more information which could only become available by systematic research.

2. THE TRADITIONAL ROLE AND STRUCTURE OF UNIVERSITIES

2.1 Retrospective

It is common to most developing countries that their universities have been created on the models of colonial powers and were therefore well adjusted, at the time of their foundation to the needs of these powers. But while western european universities have adapted themselfs to the changing needs of their socioeconomic environment, the universities of the developing countries have remained mostly unchanged (Siotis 1979).

The first Greek university was founded in Athens in 1837 on the old German model. Six other institutions of higher education were created between 1915 and 1930 and five since 1964, to answer the increasing demand for higher education (Mavridis 1979). It is significant that the same model was used for all those institutions, and still is in use in spite of the attempted reforms. Only the last two, founded after 1973, have been created on the structural principles applied currently in the United States (although there is no study showing that american models fit to the Greek milieu). The last global revision of the rules and regulations of the University of Athens was made in 1932 (Nomos 5343). Since then a series of amendments had not modified the basic concept of the structure (Mavridis 1979), until 1978 when a law provided for some changes. This law, however, has never been fully applied, due to the active opposition of various actors of the university life.

2.2 Mission and social role

In the 1932 text it is not possible to find an explicit description of the mission of the university. It was perhaps self evident that the university's role was to prepare the students for professional life, particularly for civil service and create the nucleus for the future managing elites. The means to accomplish this mission was teaching. No direct reference on research was made throughout the text, except for a brief description of the procedure for awarding doctoral degrees (109 doctorates were awarded by Greek institutions of higher education in 1962/63, 285 in 1973/74; in 1973/4 the percentage of doctoral degrees awarded on the number of graduating students was 2,2%). The university attained high prestige because it offered opportunities for white collar work, permanent jobs in the public sector (greatly appreciated in periods of political instability), or the possibility to enter into profitable business (construction, public helth, legal consulting etc). Thus the initial German model assumed in practice the French goals.

Contrary to what happened to north-western European countries, the university in Greece has been an important channel for social

mobility: up to 61% of students' fathers, in 1973-74, were primary school graduates, 24% of students' fathers were small farmers (35% farmers in total population) (National Statistical Agency of Greece 1973-74; OECD 1970).

The great number of candidates to higher studies led to a "numerous clausus" because of limited student positions available. In 1978 the ratio of candidates to such positions was 5.5:1, 11:1 in medicine (Mavridis 1979). The low economic standard of students' families and the absence of scholarships in sufficient numbers led many students to seek jobs in the labor market to assure their living: 24% of the total number of students (40-45% in social and human sciences) are working throughout the academic year (Drettakis 1977).

2.3 Integration and cohesion

The integration of universities in its socio-economic environment has been pursued mainly through politico-administrative control by the Minister of Education and his services. All important decisions concerning the life of universities such as creation of new units, appointment of professors, budget, number of students, admission procedure, curricula are ratified or approved by the Minister (Nomos 5343; Matsaniotis 1977). This poor one-link formal integration has been complemented by a much richer informal one. University professors have been political leaders, advisers to the government or to political parties, managers of important private firms, or even temporary public administrators.

The internal cohesion of universities (Rourke and Brooks 1966; Solliard, Deniozos and Paltenghi 1975) suffered from this kind of integration and from a loose administrative structure. The management of the institution seems to be accomplished by informal groups, whose members are controled for reliability by centers outside the science system (point requiring further research). Long and medium range planning of university's activities is non-existent and this has an impact on administrators' qualifications; they are unable to set up goals and objectives and to control the effectiveness of the organization.

Instead, they administrate bureaucratically, or at best entrepreneurially (Deniozos 1978) according to the rules set up by the Ministry or the university senate.

The teaching personnel of the university has been legally divided into two broad categories: professors and assistants, with different powers, functions and statuses. Professors manage their units (called "chaires"), on which they have an absolute control, participate in decision-making bodies and in socio-economic life of the society, while assistants prepare teaching courses and control the undergraduate students. The student to teaching personnel ratio has been very high in the past (in 1973, 16.5:1 referring to the total number of students, 40:1 in social and human sciences) (National Statistical Agency) and the assistant to professor ratio very low (in 1973, 3.6:1 total number of students, 1.8:1 in social and human sciences; in 1977 3.2:1 total number of students) (Mavridis 1979). Assistants have created strong unions, which very often oppose senate's and Government decisions. Although there is no published data on the social origin of professors and assistants, the recruitment processes and occupational profiles have separated assistants from professors and created an alliance between the assistants and the strong radical unionized students.

This is a condensed description of the condition of Greek higher education and as such it is imperfect and simplified. Nevertheless we can see through it how the State has used the universities in the past to satisfy its need (Tsoukalas 1975). Actually, these needs consisted mainly of educating civil servants able to execute decisions made by politicians, according to well designed procedures.

No need for research appeared to exist; academic freedom was quite understood exclusively as freedom of the politico-philosophical speech. It is worth noticing that nearly 100% of the university budget (the exact percentage is subject to further research) is financed by the public budget. The Athens' University budget is prepared by an Economic Council, which is the only body inclu-

ding academics and non-academics. The latter are appointed by the Government.

2.4 Environmental constraints

The direct subordination of universities to the Government is also a consequence of the low profile of the industrial activity. Industry has been using simple, labor intensive technologies changing slowly. The last decades, as industry expanded, more technology was needed; this technology was found abroad ready-made, or it was supposed to be so. Hence, at the beginning of the industrialization of the country no need for research was perceived and universities continued to produce diplomas but no new knowledge. But industrialization has come to a point that lack of indigenous research is considered now a major bottleneck to further development by all political parties.

Instrumentation, flexibility in the recruitment of specialized personnel and the procurement of raw laboratory material, limits on international traveling of researchers, bad management of libraries and absence of data centres, can be considered as some important problems of research until today. Soft money for research projects has been stingent and no precise information exists on the amount of funds allocated to research in universities. The amount which is provided yearly for research can be estimated at 1.8 of the ordinary budget of the seven most important institutions in 1978, and at 1% of the total budget. In no case the allocation of resources is scheduled on explicit objectives and priorities. Although information on university-industry cooperation is extreemely poor, one can securely support that private financing of university research is non-existant, with few exceptions due to personnal external relations of professors.

3. THE TIME OF REFORM

In the last five years the efforts for change of the universities operational structure and of their integration into the national and local social environment have been intensified. The creation of the peripheral universities in the sixties, on which many hopes

for change have been based, did not succeed to overcome the burden of traditionality and conservatism (a research on the causes of this failure would be of major interest).

The first official governmental act with the purpose to improve the effectiveness of the university system by replacing the professorial units ("chaires") by departments, by increasing the turnover of assistant personnel and by introducing more severe study regulations, was passed by law in 1978. As already mentioned, this law has been strongly contested by all university actors. The main argument againstit may be that it tried to settle partial problems without making explicit a commonly accepted philosophy and a policy corresponding to the measures. The law was criticized not only for what it tried to settle, but also for what if left unsettled.

Before the promulgation of the 1978 law a multitude of study groups and interest groups had proposed different charters for higher education, recommending various university models. We are going to examine hereafter the answers to the above questions and some more characteristics of two models proposed by governmental committees (from which the law was derived) and two proposed by the opposition political parties (cf. references). The analysis will be based only on formal documents and it, therefore, has limited meaning. It has more value for the similarities than for the divergences it reveals.

3.1 Determination of the mission

An effort to more or less explicitly determine the missions of higher education is obvious in all proposed charters. The missions identified are the elaboration, enlargement and transmission of knowledge through teaching and research but also, at the same level of importance, the professional training of students, the development of the critical awareness and social consiousness of future scientists. In one of the models the universities are clearly accountable for the satisfaction of actual scientific, economic, social and cultural needs of the country and the continuous education of the people.

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Thus, the charters admit research as one of the missions and this is a political choice of major importance.

3.2 Organizational structure

All charters proposed adopt the existing three-level organizationnal model: a department, a school or institute and a central level. The departments would be managed by general assemblies and directors, although one group proposed a directing board with a three-member directory in addition to the assembly. This same charter proposes the creation of at least two committees by department: one for teaching and the other for research. At the School and central levels one finds again the same schemes with different names (at central level: Senate and Rectorate). Permanent committees for curricula, research, economic affairs etc are also institutionalized.

The School level is the strongest collective decision-making level; the central bodies are considered less competent to decide on teaching and research matters. Two of the charters even give to the Minister of Education the authority to ratify a lot of decisions of the Schools and to the Schools the possibility to communicate practically directly with the Minister. This kind of structure and procedure although justified by managerial needs in overcrowded universities, does not promote interdisciplinarity, which is essential for responding to the socio-economic needs of the country, as the missions have determined. It perpetuates the compartmentalization of science and the lack of self-management of the university.

All projects institutionalize the participation of assistants and students in decision making bodies, while the heads of these bodies are appointed for one or two years. This model, combined to the fact that university administrations are traditionally weak and that there is no provision for their reinforcement, implies that university's development will be based solely on the internal political process of combining departments' influences and on external constraints.

The external constraints will be reinforced by the creation at the national level, as proposed by three charters, of a National Council of Higher Education in which would participate representatives of academics, students, Government, public administrations, unions etc. This body would dispose of a secretariat employing specialists of higher education.

3.3 Integration of the university into its environment. Great importance has been attributed to the protection of the campus from police interventions, as a consequence of the political instability of the country, the frequent radical student opposition to consecutive conservative governments and the meaning given to the academic freedom concept.

Beyond this, the creation of a National Council for Higher Education would constitute a new link between the university system and society, as well as a buffer between the university system and the Minister of Education. It would reduce the consequences of frequent changes of ministers and their personalized policies but it would reduce also the university's autonomy, if the latter will not be appropriately protected. This kind of national bodies hardly take into consideration the differences of the proper environments of each university.

On the other hand, universities tend to become closed, introverted organizations, with their managing bodies constituted solely by representatives of academics and students, except in one charter. Furthermore, the desire to have professors concentrate on their academic occupations and increase the effectiveness of universities, has led the authors of the charters to impose a preventive control on extra-academic activities, by School or central authorities. The charters proposed by the opposition's political parties even forbid to the institutions of higher education to receive private financing for research projects. This certainly would affect the kind of research to be developed in universities and inhibit the development of industry-university relations, as most of industrial firms are private.

The same charters tend to counterbalance the constraints on the relations with the private sector by institutionalizing an internal planning process, which could contribute to the improvement of universities integration into their environment. It can be hoped that this planning, if adopted, will introduce, sooner or later, a problem solving approach in the university management, by directing science toward the satisfaction of socio-economic needs through teaching and research.

3.4 Setting objectives and resource allocation

The planning functions will be shared between the universities and the National Council. The latter would decide on the creation of new universities, schools, departments, on the allocation of annual budgets, the number of freshmen by institution, the general orientations of research, the construction of new campuses etc. The distribution of planning responsibilities inside the university will be determined by internal regulations, the Schools having a particular coordinative role to play. In all cases, responsibilities would be entrusted to collective bodies (i.e. general assemblies), while rectors and deans would be responsible for the execution of decisions. Special permanent committees at all levels would play a more or less important role, depending on the power and organizational support they will be given by internal regulations.

As far as management tools are concerned, in only one project it is made explicit that each department will constitute a budgetary unit, managing its own resources throughout the year. This would improve the research planning and directing, as well as the general management of the institution. The participation of professionals of university management in decision-making will increase the rationalization of decisions.

The exclusion of private funding of research by some projects will certainly restrain the scope of the objectives, since the production sector of the country is privately owned. The limitation of funding sources to the public ones would be contradictory to practice, by discouraging the public administration to intervene into the university affairs.

Two important steps have already been got over: there is consensus on the importance of research in the development of the country and on the necessity to reinforce research in the universities. Other questions remain still open, especially the kind of research to be promoted in the universities and of the appropriate structure for that purpose.

4. IMPROVING THE RESEARCH CAPACITY

The question of committing university to research or not has received a positive answer by all political groups. The less political question of determining the kinds of research to be promoted in the university remains, nevertheless, open. Furthermore, a detailed analysis of the relation between different kinds of university research and corresponding management structures would rationalize choices (Seitelberger 1979).

We will examine in the following two categories of research, according to the goals pursued:

- to maintain the quality of the undergraduate teaching at a high level,
- to be accountable for the production of new technologies satisfying the needs of the socio-economic environment.

The first goal favors highly decentralized structure, the schools and departments being the main decision-making levels and personnel being selected for its synthetic ability and teaching effectiveness. Research will be organized on disciplinary basis and oriented toward the evaluation and synthesis of research contributions made throughout the world. The second goal favors organizationally strong central authorities, assessing social problems and creating flexible interdisciplinary units or teams to study these problems and search for original solutions. Management by objectives is the key instrument in this case.

As it can be seen, the two structures do not seem entirely compatible. One can adopt the first or the second, according to the main local needs, or introduce a combination by diversifying the university's output. The detailed analysis would show the poten-

tialities and the limits of compatibility by disciplines (degree of specialization, innovative potential, servicing to neighbour disciplines, frequency of involvement in research oriented to socio-economic needs, requirements for investment etc), by level of study (earlier and later years of undergraduate, post-graduate, post doctoral etc) and following the requirements for training in research in each level of study, according to the professional specifications. As the specifications for one profession can differ from country to country, the extent of undergraduate training in research will vary greatly. As the economy of a country does not expand uniformly in all provinces, it is quite evident that uniformity in higher education has to be avoided. Each university has to scan its own environment and set appropriate objectives.

In either structures the effectiveness of the university research and its management depends greatly on the effectiveness of the planning and the structure of the socio-economic environment. A government wishing to develop research in higher education has to promote the establishment of several structures and procedures; we mention here the need to encourage the endogenous development of local industries and to give them incentives to search for solutions to their technical and organizational problems in the country, instead of buying ready-made solutions (patents, products etc) abroad and hence the need to protect industry from foreign control : to integrate science and technological applications. These are "sine qua non" conditions for the development of research in the country.

Furthermore, we should question the quality of primary and secondary education, the effectivenes of the information and documentation networks, of the extension services, of the maintainance services for scientific instruments and technical equipment, of the labor policy concerning the research personnel and of the national policy in relation to the university management.

Furthermore, it has to be taken into account that modern scientific research is a product of the Anglo-Saxon culture; therefore, it

is probable that the researchers of other countries, and especialy of developing countries, will have to find their own ways in creating new knowledge.

Division of responsibilities between ministerial (Governmental) and institutional levels means that the criteria for selecting priorities at the two levels will be complementary to one another. While the Ministry with its consultative bodies will determine the missions and the national goals, universities will decide upon local objectives of research and internal allocation of resources. This implies that universities function as an open system with continuous linkage with its environment. Nevertheless, the balance between direct accountability and self-management has to be kept by academics as the most important element of university life. Excess of accountability can lead to transformation of universities to professional schools and to compartmentalization of science, and thus to the loss of their identity (this balance is certainly not univocal).

In a "teaching oriented" institution the Greek experience has found that planners should pay attention to the following parameters:

- good understanding between the different categories of academic personnel, hence abolishment of the enormous status distance between professors and assistants
- good working and living conditions and high need for achievement for students (high need for achievement is affected by devaluation of diplomas)
- sane management of the basic academic unit (the "chaires" been replaced by manageable departments)

When the planners decide to introduce a teaching-research combination they have, in addition to the above, to take into account that:

- managing authorities of universities, such as rectors, senats, managing boards etc. cannont be simply respesentatives of their peers, but they have to manage the institution, to establish and apply policies; thus they have to

be given the appropriate instruments (offices for elaboration of decisions, appropriate procedures and budget structures etc)

- lower undergraduate levels of teaching and training could be negatively affected if the obligations of academics for teaching is not made clear enough; as in some European countries, (Office fédéral de l'éducation et de la science 1979) it would be probably advisable to organize undergraduate curricula into two levels, each of them leading to a diploma.

Planners should also introduce appropriate standards for teaching and research minimal conditions, encourage young scientists and project funding. The use of foreign researhers in local teams for planning, organizing and executing research, under controlled conditions, should have beneficial impact on research quality.

The transition from the old system to a new one is a hard task, and universities have to be assisted to come through this challenge. Management by conflict will often be an appropriate instrument for decision makers. Change will have to start at points where strain and stress exist, but not at the point of greater stress (Benne, Birnbaum 1969). Ordinarily, change should start with the policy making body. All actors of the university life will have to admit that no model, is perfect, nor has a self-evident effectiveness and that experimentation is necessary to achieve satisfactory results and consensus. The diffusion of a research motivated mentality will very probably contribute to these changes.

ACKNOWLEDGEMENTS

Thanks to MM D. Agrafiotis, A. Barblan and Ms Argyropoulou for their valuable remarks.

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